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## MULTI-FUNCTION CONTROL KEY STRUCTURE

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

5       The present invention relates to a multi-function control key structure for an electronic device, for example, a computer, video cassette player/recorder, remote controller, etc.

#### 2. Description of Related Art

An electronic consumer product may be provided with a so-called 10 multi-function key assembly, which has a button exposed to the outside for multiple function controls, for example, up, down, left, right controls.

Regular multi-function key assemblies include two types, namely, the so-called 4-in-1 and the so-called 5-in-2. A 4-in-1 multi-function key assembly provides up, down, left, and right control functions. If an 15 electronic device needs more than four control functions, a 4-in-1 multi-function key assembly cannot meet the requirement. Further, a 5-in-2 multi-function key assembly comprises an outer key unit and a center key unit. The outer key unit provides up, down, left, right controls. The center key is for another function control. A 5-in-2 multi-function key assembly 20 settles the insufficient function control problem of a 4-in-1 multi-function key assembly, however the additional center key unit greatly complicates the manufacturing process and increases the manufacturing cost.

Further, US 6,441,753 discloses a multi-function key assembly for electronic device. This design of multi-function key assembly is applicable

for 8 different function controls. However, this design of multi-function key assembly uses a big number of parts. Further, the button of this design of multi-function key assembly may not return to its former position after having been pressed,

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## SUMMARY OF THE INVENTION

It is the main object of the present invention to provide a multi-function control key structure, which is formed of only two parts that are easy and inexpensive to manufacture and, which prevents erroneous 10 triggering during operation.

To achieve this and other objects of the present invention, the multi-function control key structure is formed of a springy key body and a key cap mounted in the springy key body. The key body comprises a flat annular base, an annular flange protruded from one side of the flat annular 15 base, a center through hole surrounded by the annular flange, and a springy plate disposed in the center through hole. The springy plate comprises a center through hole and a plurality of first spring arms and second spring arms equiangularly arranged around the center through hole of the springy plate. The first spring arms are respectively connected to the flat annular 20 base, each having a middle mounting hole. Each second spring arm has a free end terminating in a downwardly extended triggering rod. The key cap is mounted in the center through hole in the annular flange of the springy key body, comprising a bottom wall, a shank perpendicularly downwardly extended from the center of the bottom wall and inserted into the center

through hole of the springy plate, a plurality of driving rods perpendicularly downwardly extended from the bottom wall and equiangularly arranged spaced around the shank corresponding to the triggering rods of the second spring arms, and a plurality of locating rods perpendicularly downwardly 5 extended from the bottom wall and equiangularly arranged around the shank and respectively fastened to the mounting holes of the first spring arms to cause said driving rods respectively spaced from the triggering rods of said second spring arms at a predetermined distance.

When pressing the border area of the key cap to force one driving 10 rod against the respective triggering rod of the key body, the respective triggering rod trigger the respective key switch. At this time, the key cap is tilted to bias the shank, preventing an accidental triggering action of the shank. When pressing the center area of the key cap to force the shank to trigger the respective key switch, the action does not cause the triggering 15 rods to make an accidental triggering action because the driving rods are kept away from the triggering rods at a distance.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an applied view showing a multi-function control key 20 structure installed in a computer according to the present invention.

FIG. 2 is an exploded view in an enlarged scale of a part of FIG. 1.

FIG. 3 is an exploded, oblique bottom view of the multi-function control key structure according to the present invention.

FIG. 4 is a sectional view of the multi-function control key structure

according to the present invention.

FIG. 5 is a schematic drawing showing one operation action of the multi-function control key structure according to the present invention.

FIG. 6 is a schematic drawing showing another operation action of  
5 the multi-function control key structure according to the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, a computer 9 is shown having a front face panel 3 and a multi-function control key structure 6 installed in the front face panel 3.

10 Referring to FIG. 2 and FIG. 1, the front face panel 3 has an outer surface 31, an inner surface 32, and a through hole 33 extended through the outer surface 31 and the inner surface 32. The multi-function control key structure 6 comprises a springy key body 1 and a key cap 2. The key body 1 and the key cap 2 are installed in the front face panel 3.

15 Referring to FIGS. 3 and 4 and FIGS. 1 and 2 again, the key body 1 comprises a flat annular base 10 and an annular flange 11 protruded from one side of the flat annular base 10 around the inner diameter of the flat annular base 10. The annular flange 11 is inserted into the through hole 33 of the front face panel 3. The flat annular base 10 is bonded to the inner 20 surface 32 of the front face panel 3 by heat sealing.

Further, the annular flange 11 of the key body 1 defines a center through hole 13. The key body 1 further comprises a springy plate 14 disposed in the center through hole 13. The springy plate 14 comprises a center through hole 141 disposed in axial alignment with the center through

hole **13** in the annular flange **11**, four equiangularly outwardly extended first spring arms **15**, and four equiangularly outwardly extended second spring arms **16**. The first spring arms **15** are respectively connected to the flat annular base **10** of the key body **1**, each having a middle mounting hole **151**. Each second spring arm **16** has a free end **160** and a triggering rod **161** downwardly extended from the free end **160**.

Further, the key cap **2** is mounted in the center through hole **13** in the annular flange **11**, comprising a bottom wall **21**, a shank **24** perpendicularly downwardly extended from the center of the bottom wall **21** and inserted into the center through hole **141** of the springy plate **14**, four driving rods **22** perpendicularly downwardly extended from the bottom wall **21** and equiangularly spaced around the shank **24** corresponding to the triggering rods **161** of the second spring arms **16**, and four locating rods **23** perpendicularly downwardly extended from the bottom wall **21** and equiangularly spaced around the shank **24** and respectively bonded to the mounting holes **151** of the first spring arms **15** by heat sealing. After installation of the key cap **2** in the key body **1**, the driving rods **22** are respectively kept away from the root of each triggering rod **161** at a predetermined distance **d**.

During installation of the key body **1** and the key cap **2** in the front face panel **3**, the triggering rods **161** of the key body **1** and the shank **24** of the key cap **2** protrude over the inner surface **32** of the front face panel **3** and are respectively aimed at five key switches **41~45** of a circuit board **4**, wherein the shank **24** of the key cap **2** is aimed at the center key switch **45**;

the triggering rods **161** of the key body **1** are respectively aimed at the other four key switches **41~44** around the center key switch **55**.

As indicated above, the multi-function control key structure **6** is formed of the springy key body **1** and the key cap **2**, and capable of 5 triggering the center key switch **45** by means of the shank **24** or the key switches **41~44** by means of the driving rods **22** of the key cap **2** via the triggering rods **161** of the key body **1** respectively.

Referring to FIG. 5 and FIGS. 2~4 again, when wishing to trigger one of the key switches **41~44** around the center key switch **41**, directly 10 press the border area of the key cap **2** to force the corresponding driving rod **22** against the respective triggering rod **161** of the key body **1** as shown in FIG. 5, thereby causing the respective triggering rod **161** to trigger the respective key switch **42**. Because the key cap **2** is tilted at this time, the shank **24** is biased from the triggering position, preventing triggering of the 15 center key switch **45** by the shank **24** accidentally.

Referring to FIG. 6 and FIGS. 2~4 again, when wishing to trigger the center key switch **45**, directly press the center area of the key cap **2** to force the shank **24** against the center key switch **45**. Because the driving rods **22** are respectively kept away from the triggering rods **161** at a distance 20 **d**, which is greater than the down stroke of the shank **24** to trigger the center key switch **45**, triggering the center key switch **45** by the shank **24** does not cause the triggering rods **161** to trigger the other key switches **41~44** accidentally.

If the user pressed the key cap **2** with an excessive force to force the

triggering rods **161** to touch the other key switches **41~44** around the center key switch **45** accidentally, at this time the prestress of the key switches **41~44** and the spring prestress of the second spring arms **16** cause the springy plate **14** to curve upwards through an angle “a” as shown in FIG. 6, 5 preventing triggering of the key switches **41~44** erroneously.

In the aforesaid preferred embodiment, the number of the triggering rods **161** of the key body **1** and the number of the driving rods **22** of the key cap **2** are 4. The number of the triggering rods **161** of the key body **1** and the number of the driving rods **22** of the key cap **2** may be changed to 5 or even 10 more for controlling more key switches. When changing the design, the size of the key body **1** and the key cap **2** may be relatively increased.

Although the present invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the scope 15 of the invention as hereinafter claimed.